Attorney Docket No. BKA-22402/01

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**



| | | | |
|---|---|---|---|
| Applicant: | Andrew McKaig | | |
| Serial No.: | 09/827,053 | | Group Art Unit: 3753 |
| Filed: | April 5, 2001 | | Examiner: Gerald A. Michalsky |
| For: | GAS ASSIST MOLD DUMP VALVE | | |

---

## DECLARATION OF ANDREW MCKAIG

1. I, Andrew McKaig, declare under penalty of perjury that the following is true and correct:

2. I am a resident of the United States having a business address at Bauer Compressors, Inc., 1328 Azalea Garden Road, Norfolk, VA 23502. A copy of my curriculum vita is attached hereto as Exhibit A.

3. I am the inventor of the invention disclosed in the above-identified application.

4. The invention of the application is principally directed to a gas assist mold dump valve that is positioned between a gas controller and a mold cavity. The valve includes a check valve and a pressure regulator that includes a piston.

5. As disclosed in the application, the check valve prevents backflow of gas from the mold cavity into the controller.

6. The piston of the pressure regulator of th invention is discuss d in the application as being dimensioned so that the "regulator is calibrated to have a ratio greater than 1:1, but preferably near to 1:1, dome-to-seat area ratio . . ."

7. Regarding the 1:1 ratio, the application explains that the use of a "near 1:1 ratio also permits the piston 26 to be closed and balanced by upstream pressure from the gas controller 16." Furthermore, "the close to 1:1 ratio will allow the valve 10 of the present invention to dump downstream pressure equal to the lowest set point pressure attainable by the upstream gas controller 16."

8. One of skill in the art would understand that the piston of the regulator of the present invention may placed in three possible positions, to wit: full open, full closed or an intermediate position balanced between the full open and full closed based upon a reading of the present application, including those parts excerpted in paragraphs 6 and 7.

My reasons for this conclusion are as follows:

9. Regarding the process of increasing pressure from the controller, the internal pressure of the mold cavity, being lower than that of the gas controller outlet due to the positive rate of change of the pressure on the outlet of the controller, provides for a resultant force that biases the near one to one piston into a

position that positively closes the venting side of the valve. The pressure drop across the valve body will allow gas to flow through the check valve portion of the valve and into the mold cavity. As a result, the valve position is fully closed and seated by a positive force.

10. Decreasing the gas pressure on the inlet side of the vent valve by the gas controller allows the higher pressure on the mold side of the cavity to overcome the force holding the valve in the closed position and will push the valve to a position between not closed and fully open in a manner that will be proportional to the rate of change of the gas pressure on the inlet side of the valve. The gas vented from the mold side of the valve will be directed through said valve to a third port while checking any contaminated gas from passing through to the controller hardware. As a result, the valve position is positioned between the fully open and fully closed position to allow for controlled venting.

11. Finally the gas controller of the present invention can maintain a constant pressure set point at some pressure between the minimum and the maximum pressure required by the mold cavity during either the filling or the venting portion of the pressure profile. During this fixed inlet pressure state, drops in cavity pressure due to increases in part internal volume or part cooling will cause the gas to flow through the internal check valve. Increases in mold pressure due to the addition of plastic material or the increase in mold temperature will overcome the positive seal on the valve seat causing leakage and allowing excess gas to

vent from the valve. As a result the valve is closed, but with only a minimal force on the seat to provide for bi-directional leakage into and out of the mold cavity as necessary.

12. One having skill in the art would understand that, except for specialized instances (e.g., quantum pistons), any piston in any regulator that moves between a fully closed and a fully open position must travel through an intermediate space between those positions.

13. One having skill in the art would also understand that a piston can also be placed in a balance state if a calibrated amount of force is applied to opposite sides of that piston.

14. The piston of the regulator of the present invention is disclosed in the application as being dimensioned so that the "regulator is calibrated to have a ratio greater than 1:1, but preferably near to 1:1, dome-to-seat area ratio...". One having skill in the art would understand the use of a calibrated 1:1 ration to mean that if an equal force were applied to the dome or the seat of the piston then the piston would move substantially the same distance in response to that force (but in opposite directions).

15. Accordingly, one having skill in the art would understand that the piston of th regulator of the present invention can be "balanced" if the force of the upstream

pressure from the gas controller and the downstream pressure from the mold cavity is equal.

16. In view of the above, one having skill in the art would understand that the application's statement that the "near 1:1 ratio also permits the piston 26 to be closed and balanced by upstream pressure from the gas controller 16" would allow the piston to be in a closed but balanced such that only a minimal force on the seat is necessary to provide for bi-directional leakage into and out of the mold cavity.

17. Furthermore, one having skill in the art would understand that the phrase "lowest set point pressure attainable by the upstream gas controller" as used in the application means that a pressure of zero psi or greater is being emitted by the gas controller.

18. When the lowest set point pressure attainable by the upstream gas controller is greater than zero psi, but less than the downstream pressure from the mold cavity, one having skill in the art would understand that the pressure from the controller would prevent the piston of the regulator from being seated in a fully open position.

19. As a result, the piston must be balanced at an intermediate position between fully open and fully closed with force at a point where the flow area of the open valve

would be proportional to the rat of change of the pressures supplied to the valve inlet and outlet and the difference in force exert d by the upstream and downstream pressures. The size of the valve opening approaching zero as the inlet and outlet pressures approach an equilibrium.

20. Therefore, one having skill in the art would understand that the piston of the regulator of the present invention, as described, in the above application may be placed in either a: 1) fully closed position (wherein the gas controlling is increasing the upstream pressure and charging the mold cavity); 2) a fully open position (wherein the mold cavity is undergoing an uncontrolled venting) and in intermediate position.

21. One having skill in the art would also understand that the intermediate position includes a first state wherein the piston is balanced by the upstream and downstream pressure into a closed, but with only a minimal force on the seat to provide for bi-directional leakage into and out of the mold cavity as necessary. See Paragraph 11.

22. Finally, one having skill in the art would also understand that the intermediate position also includes a second state wherein the piston is balanced at an int rmediate position between a fully open and fully closed position and at a set point where the pressure between the controller and the mold cavity is equal

Further declarant sayeth not.

Andrew McKaig

Executed on: Oct 17th 2003